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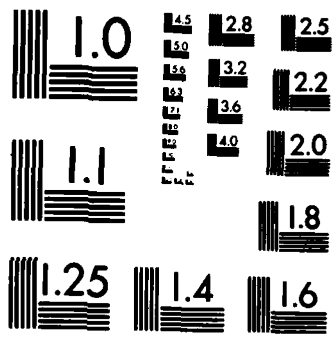

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MEMORANDUM REPORT BRL-MR-3454

AD-A159 323

WEDGES USED FOR FILM CASSETTE PROTECTION

Gary L. Boyce

July 1985

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US ARMY BALLISTIC RESEARCH LABORATORY
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Explosives	Wedges and Cones
Blast Pressures	Cassette

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report discusses the protection of flash x-ray film cassettes during explosive tests. The problem is to protect the x-ray film while placing a minimum amount of material in the path of the x-rays. This report demonstrates that using a hollow wooden wedge, with a 60° included angle, on the front of the cassette, dramatically reduces the damage to the cassette and film.

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I. INTRODUCTION

High voltage flash x-ray systems are frequently used for observing explosive events. During such tests the x-ray screen and film must be protected from the blast from the charge, but the areal density of the protection must be small enough so that the x-rays are not blocked. In outdoor ranges this problem is minimized, but not eliminated, by letting the cassettes move in response to the blast. In enclosed chambers the problem is more severe because the motion of the cassettes must be restricted. Tests in our blast chambers are usually performed with the object about 2 - 4m from the x-ray tubes and about 0.6m from the cassette which holds the screen and film. The standard x-ray cassettes~~, shown in Figure 1,~~ consist of layers of aluminum, felt, foam, and a steel backing. They are typically 450mm by 530mm in area. Based on the Hewlett Packard Flash X-ray Manual, our 300kV flash x-rays will penetrate the equivalent of 50mm of aluminum at a distance of 3m. ~~as shown in Figure 2.~~ This means one can safely use 25mm of aluminum on the front of the cassette and still have some ability to penetrate the test charge. Experience indicates that this is adequate to protect the cassette for explosive charges of up to 0.5kg, but it is inadequate for larger charges.

This report discusses the use of hollow wooden cones or wedges on the front of the cassette. The technique appears to offer excellent protection with a minimum of areal density. A similar technique, involving an aluminum cone, has been used at the Los Alamos National Laboratory.[1]

II. EXPERIMENTAL SETUP AND RESULTS

Tests were performed in similar circumstances with and without wooden cones or wedges. The setup without the extra protection is shown in Figure 3; with the extra protection, it is shown in Figure 4. An explosive charge of 2 or 4kg was detonated 508mm above a cover plate which consisted of either 25mm of aluminum or 25mm of plywood. The cover plate was supported on its edges by a steel frame which rested on the floor of the blast chamber. The cover plate area was 450mm by 530mm. The wedges on cones were made of 19.6 or 25.4mm plywood and had an included angle of 60°, as shown in Figure 4.

The data is shown in Table 1. With a 60° cone, a 25mm aluminum cover plate was undamaged by a 4kg charge. Without a cone, even a 2kg charge caused unacceptable damage. However, plywood cover plates did not provide acceptable protection, even with a cone.

1. LASL Phermex Data, Vol I, Mader, Neal, and Dick.

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Table 1. Experimental Results

	Cover Plate	Cylinder Comp-B charge	Angled Plywood Protector	Damage to Cover Plate
1.	7039 25 mm alum	4.5 pounds	60° Cone	No damage
2.	7039 25 mm alum	4.5 pounds	No cone	25 - 31.25mm bend
3.	25 mm plywood	4.5 pounds	60° cone	Destroyed cover plate
4.	7039 25 mm alum	9 pounds	60° cone	No damage
5.	25 mm alum	9 pounds	No cone	25 - 31.25mm bend
6.	9 mm alum/1" plywood 3 mm alum	4.5 pounds	60° cone	Front bent 25 mm Did not spall
7.	25 mm alum	4.5 pounds	60° wedge	No damage
8.	9 mm alum/25 mm plywood/3 mm alum	4.5 pounds	No cone	Excessive damage, alum plates would cause damage to screens

III. CONCLUSION

A wooden cone or wedge provides considerable additional protection to a film cassette with a minimum of added areal density. This technique is being utilized in the blast chambers in Building 1186, as shown in Figures 5 and 6.

ACKNOWLEDGEMENTS

The author wishes to thank Dr. Robert Frey (BRL) and Mr. Al Kennedy (Hewlett Packard Representative) for their helpful discussions.

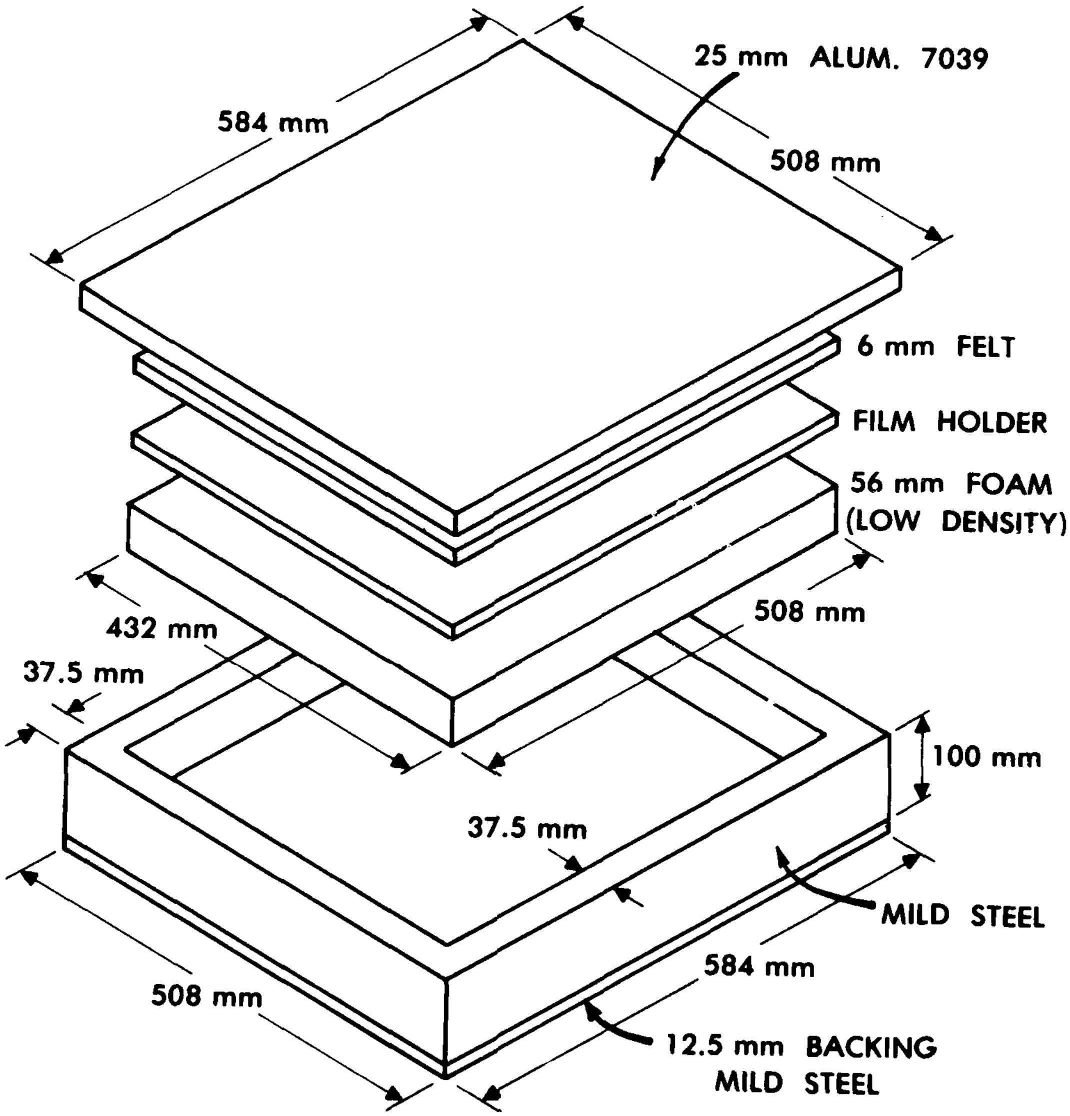


Figure 1. Film Cassette.

GENERAL CONDITIONS	0.7 Gross Film Density Kodak XR5 (RPR, Royal Blue) TI-2 or Equivalent Screens	6 Minute Development at 68°F (20°C) Subject Close to Film

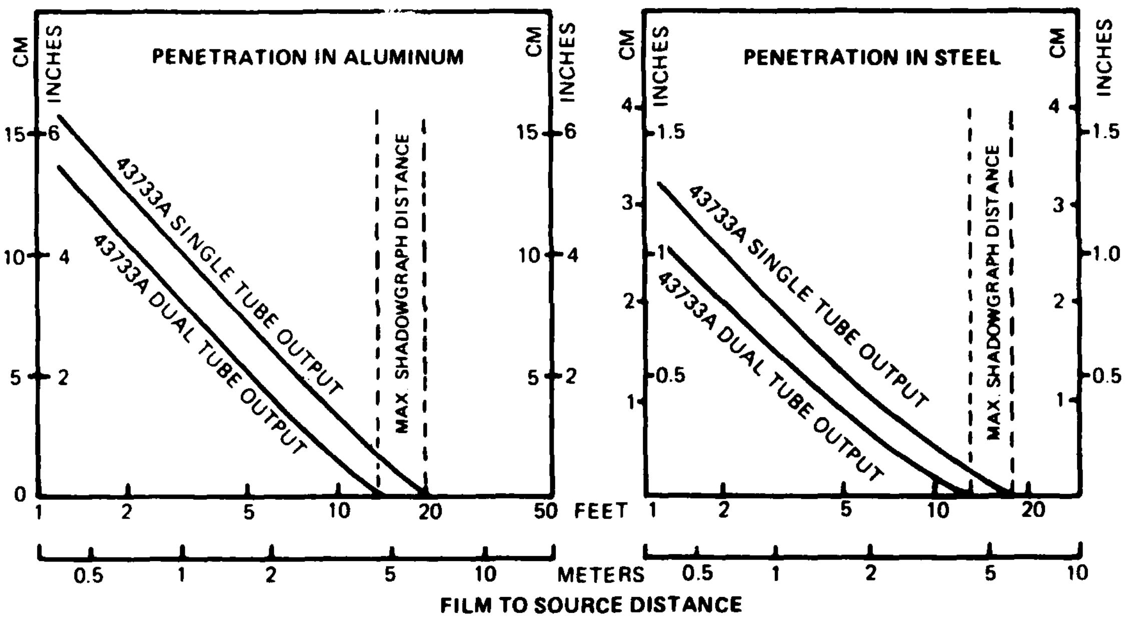


Figure 2. Penetration Curve for 300 KV Flash X-Ray System - Model 43733A.

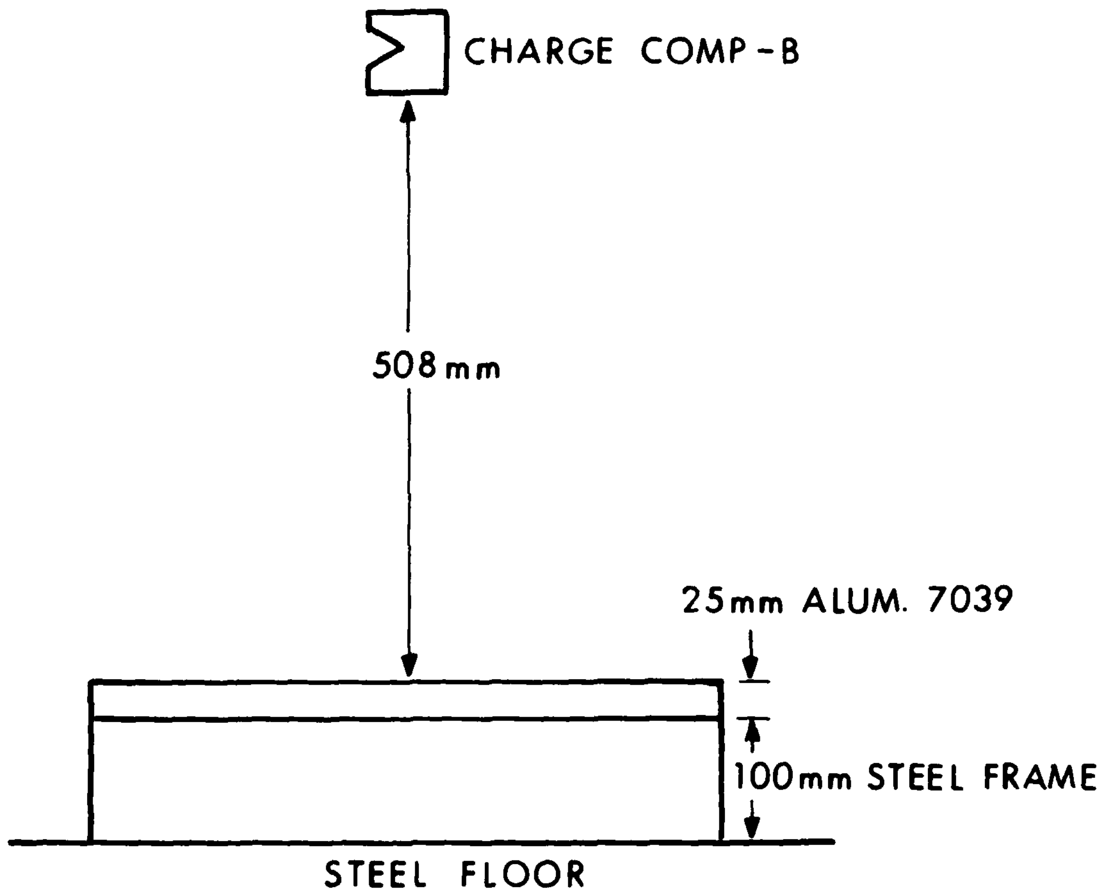


Figure 3. Film Cassette without Wedge.

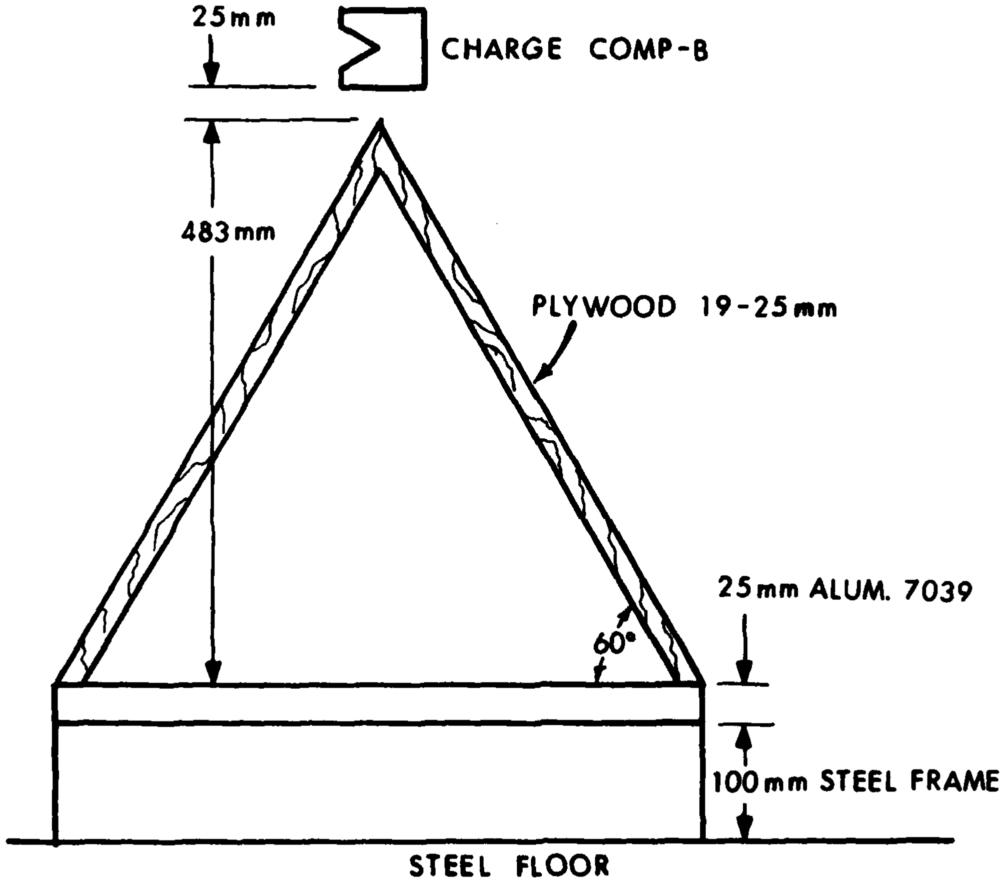
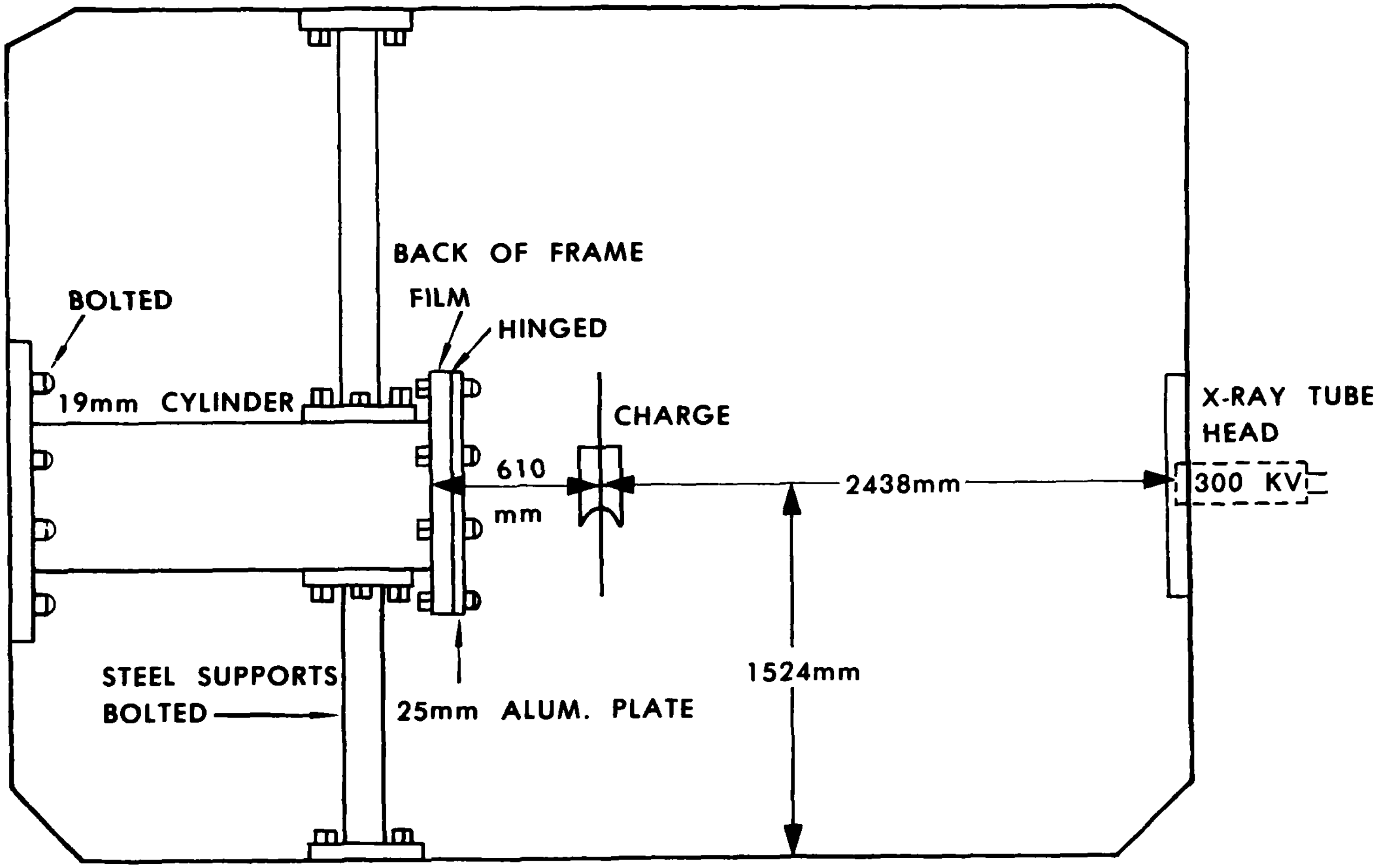


Figure 4. Film Cassette with Wedge.



CASSETTE USED IN CHAMBER

Figure 5. Film Cassette in Chamber using 300 KV Flash X-Ray.

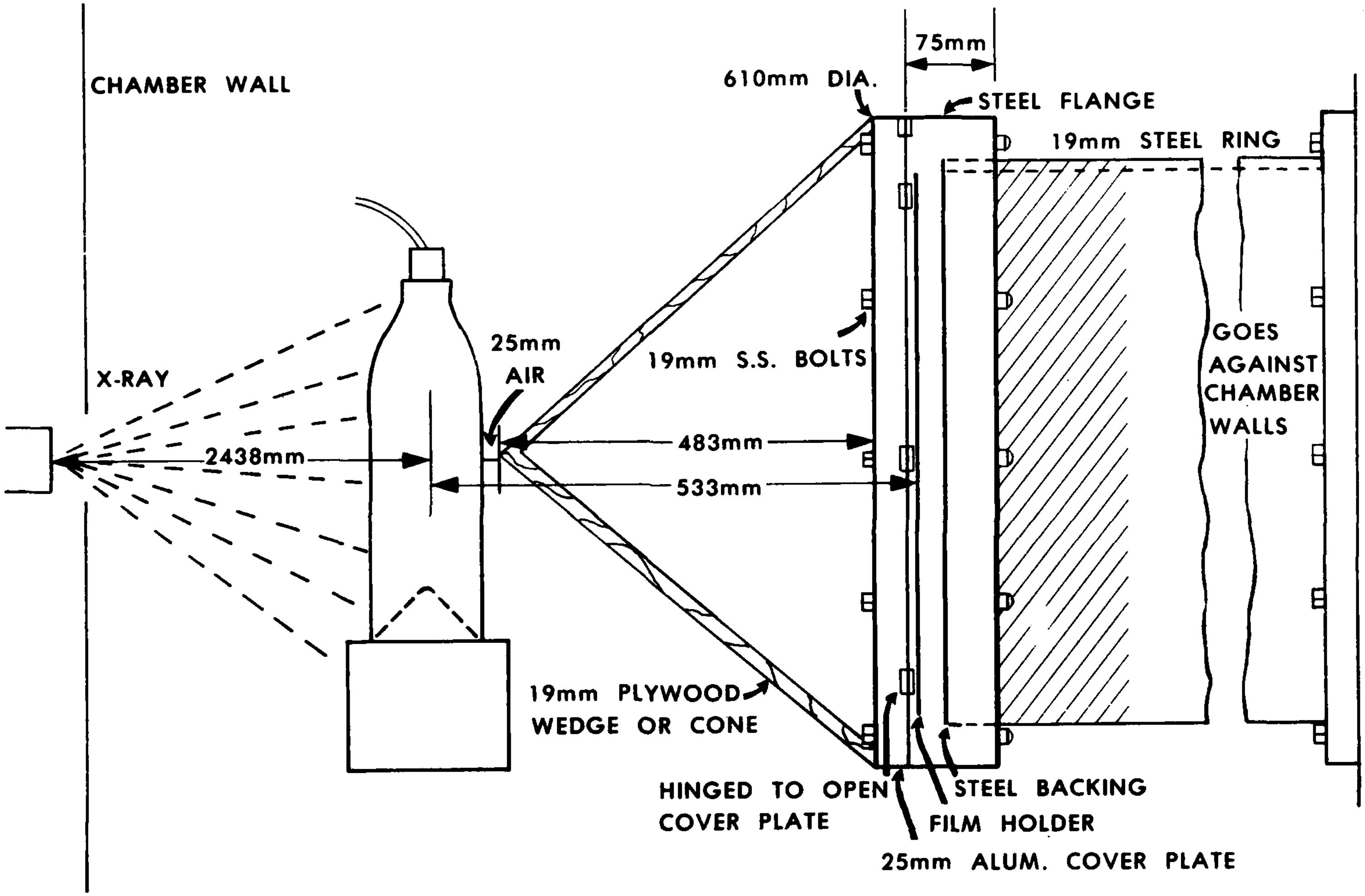


Figure 6. Film Cassette in Chamber using Cone or Wedge.

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